



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: ETHYLENE OXIDE

1. Chemical Product and Company Identification

**BOC Gases,
Division of
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974**

**BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6**

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER:
CHEMTREC (800) 424-9300

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER:
(905) 501-0802
EMERGENCY RESPONSE PLAN NO: 20101

PRODUCT NAME: ETHYLENE OXIDE
CHEMICAL NAME: Ethylene Oxide
COMMON NAMES/SYNONYMS: Ethoxyethane; Oxirane
TDG (Canada) CLASSIFICATION: 2.3 (2.1)
WHMIS CLASSIFICATION: A, B1, D1A, D2A, D2B

PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATE: 6/7/96

2. Composition, Information on Ingredients

INGREDIENT	% VOLUME	PEL-OSHA ¹	TLV-ACGIH ²	LD ₅₀ or LC ₅₀ Route/Species
Ethylene Oxide FORMULA: C ₂ H ₄ O CAS: 75-21-8 RTECS #: KX2450000	> 99.7	1 ppm TWA 5 ppm 15 minute Excursion	1 ppm TWA A2	LC ₅₀ 800 ppm/4H

¹ As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

² As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

3. Hazards Identification

EMERGENCY OVERVIEW

Exposure to ethylene oxide may depress the central nervous system. This chemical is suspected of being a human carcinogen and toxic to the reproductive system. Highly flammable.

PRODUCT NAME: ETHYLENE OXIDE

ROUTE OF ENTRY:

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

Exposure Limits Yes	Irritant Yes	Sensitization No
Teratogen Yes	Reproductive Hazard Yes	Mutagen Yes
Synergistic Effects None Reported		

Carcinogenicity: -- NTP: Yes IARC: Yes OSHA: Yes

EYE EFFECTS:

The vapor is irritating to the eyes, and the liquid can cause delayed burns if it contacts the eyes. Aqueous solutions of ethylene oxide are also irritating.

SKIN EFFECTS:

Vapor and liquid in contact with the skin can cause irritation and delayed burns. Aqueous solutions of ethylene oxide are also irritating.

It is also reported that rapid evaporation of the liquid on contact with the skin can cause a type of frostbite. Frostbite is a change in the color of the skin to gray or white, possibly followed by blistering.

INGESTION EFFECTS:

None. Product is a gas. Ingestion is unlikely.

INHALATION EFFECTS:

Low concentrations inhaled will cause delayed nausea. Inhalation of high concentrations results in a narcotic and possible neurotoxic effect -- possibly followed by coughing, vomiting, and irritation to the respiratory passages which will eventually lead to emphysema, bronchitis, and pulmonary edema. It has been reported to cause rapid olfactory fatigue.

The neurotoxic or narcotic effect results in respiratory failure with acute pulmonary edema. Comas with metabolic acidosis and oxaluria have also been observed. It has been known to cause chronic intoxication in humans.

Ethylene oxide is a suspect human carcinogen. Exposure may cause toxicity to the human reproductive system including spontaneous abortions.

Chromosomal aberrations have been detected in ethylene oxide exposed workers.

PRODUCT NAME: ETHYLENE OXIDE

NFPA HAZARD CODES

Health: 3
Flammability: 4
Reactivity: 3

HMIS HAZARD CODES

Health: 3
Flammability: 4
Reactivity: 3

RATINGS SYSTEM

0 = No Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

4. First Aid Measures

EYES:

PERSONS WITH POTENTIAL EXPOSURE SHOULD NOT WEAR CONTACT LENSES. Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes. Repeat for subsequent 15 minute periods if irritation returns. Seek immediate medical attention.

SKIN:

Remove contaminated clothing and flush affected areas with large amounts of lukewarm water. Delayed burns may result, seek immediate medical attention.

INGESTION:

None anticipated as product is a gas at room temperature.

INHALATION:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD. Conscious persons should be assisted to an uncontaminated area, made to recline, kept warm, and given warm water in amounts adequate to purge their stomachs of the ethylene oxide contamination. In the event of severe exposure, oxygen should also be administered by a competent person. The physician should look for signs of lung congestion. Unconscious persons should be moved to an uncontaminated area and given mouth-to-mouth resuscitation and supplemental oxygen. Once respiration has been restored, treatment should be as above.

5. Fire Fighting Measures

Conditions of Flammability: Flammable		
Flash point: Not Available	Method: Not Available	Autoignition: Temperature: 806°F (430°C)
LEL(%): 3	UEL(%): 100	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS:

Ethylene oxide is flammable over an extremely wide range in air.

Ethylene oxide stored in the liquid state can be maintained free of explosion hazard in the gaseous phase by the introduction of nitrogen at sufficient pressure. An example, at 70°F (21 °C) a nitrogen pressure of 32.6 psia (225 kPa) is required; while at 104°F (40°C) a nitrogen pressure of 63.1 psia (9435 kPa) is required.

MSDS: G-90

Revised: 6/7/96

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The decomposition temperature of ethylene oxide is 1060°F (571°C). This reaction is highly exothermic with the temperature rising from 1060°F (571°C) to 2190°F (1199°C) in only 2 milliseconds.

EXTINGUISHING MEDIA:

Water mist or spray. Carbon dioxide, dry chemicals and foams. It must be diluted 22 times by volume in water before it is no longer flammable.

FIRE FIGHTING INSTRUCTIONS:

In order to reduce the risk of fire and explosion, ethylene oxide is mixed with inert gases such as carbon dioxide and nitrogen. For example, a gas mixture containing 1 part of ethylene oxide with 9 parts of carbon dioxide is not flammable in air.

6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Electrical equipment should be non-sparking or explosion proof.

Metal acting as catalysts for the decomposition of ethylene oxide include copper, silver, mercury, magnesium and their alloys. Potassium, tin, zinc, aluminum and iron oxides tend to accelerate the polymerization of ETO. Earth-ground or bond all lines and equipment associated with the ETO system.

Unless specifically labeled this materials is NOT to be used as a pesticide.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve protection outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (< 50 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Protect cylinders from physical damage.

Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C) to prevent polymerization. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "NO SMOKING OR OPEN FLAMES" signs in the storage area or use area. There should be no sources of ignition in the storage or use area.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

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8. Exposure Controls, Personal Protection

EXPOSURE LIMITS¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV-ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Ethylene Oxide FORMULA: C ₂ H ₄ O CAS: 75-21-8 RTECS #: KX2450000	> 99.7	1 ppm TWA 5 ppm 15 minute Excursion	1 ppm TWA A2	LC ₅₀ 800 ppm/4H

¹ Refer to individual state of provincial regulations, as applicable, for limits which may be more stringent than those listed here.

² As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

³ As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

ENGINEERING CONTROLS:

Hood with forced ventilation. Local exhaust to prevent accumulation above the exposure limit. Mechanical in accordance with electrical codes.

EYE/FACE PROTECTION:

Safety goggles or glasses, and transparent face shield.

SKIN PROTECTION:

Ethylene oxide softens most plastics and produces surface blisters on most rubber-based compounds. Use gloves and protective clothing resistant to ethylene oxide.

RESPIRATORY PROTECTION

Level C respiratory protection with full-face mask and escape bottle or a self-contained breathing apparatus should be available for emergency use. Operate this equipment in the positive pressure demand mode. Use a supplied air respirator for routine use.

OTHER/GENERAL PROTECTION

Safety shoes, safety shower, eyewash "fountain".

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure at 70°F	: 20.7	psia
Vapor density at STP(Air = 1)	: 1.7	
Evaporation point	: Not Available	
Boiling point	: 51	°F
	: 10.7	°C
Freezing point	: -169.1	°F
	: -111.7	°C
pH	: Not Available	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H ₂ O)	: Very soluble/reacts	
Odor threshold	: Not Available	
Odor and appearance	: A colorless gas with a sweet odor.	

MSDS: G-90

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10. Stability and Reactivity

STABILITY:

Unstable at elevated temperatures. Ethylene oxide should be stored at temperatures less than 130°F (54°C).

INCOMPATIBLE MATERIALS

Vapors may react violently with caustic soda, hydrated lime (quicklime), magnesium chloride, ammonia, alcohols and amines. Most materials other than stainless steel or nickel will cause polymerization or decomposition. Decomposition may cause exothermic rearrangement.

HAZARDOUS POLYMERIZATION:

May occur. Presence of catalysts such as pure iron, aluminum oxide, or anhydrous chlorides of iron, aluminum or tin accelerates polymerization.

11. Toxicological Information

REPRODUCTIVE:

Evidence of spontaneous abortions in humans has been reported as a result of exposure to ethylene oxide. California's Proposition 65 lists ethylene oxide as a reproductive toxin.

MUTAGENIC:

Chromosome aberrations of unknown significance have been found in exposed workers.

TUMORIGENIC:

IARC, NTP, OSHA and ACGIH consider ethylene oxide to be a suspect human carcinogen. Additional studies by the National Board of Occupational Safety and Health in Sweden may indicate that extended or intermittent exposures to low concentrations may develop leukemia or stomach cancer.

12. Ecological Information

No data given.

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Ethylene Oxide	Ethylene Oxide
HAZARD CLASS:	2.3	2.3 (2.1)
IDENTIFICATION NUMBER:	UN 1040	UN 1040
SHIPPING LABEL:	POISON GAS, FLAMMABLE GAS	POISON GAS, FLAMMABLE GAS

Additional Marking Requirement: "Inhalation Hazard"

Additional Shipping Paper Description Requirement: "Poison-Inhalation Hazard, Zone C"

MSDS: G-90

Revised: 6/7/96

15. Regulatory Information

Ethylene oxide is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

SARA TITLE III NOTIFICATIONS AND INFORMATION

Ethylene oxide is listed as an extremely hazardous substance (EHS) subject to state and local reporting under Section 304 of SARA Title III (EPCRA).

The presence of ethylene oxide in quantities in excess of the threshold planning quantity (TPQ) of 1,000 pounds requires certain emergency planning activities to be conducted.

Releases of ethylene oxide in quantities equal to or greater than the reportable quantity (RQ) of 10 pounds are subject to reporting to the National Response Center under CERCLA, Section 304 SARA Title III.

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

CAS NUMBER	INGREDIENT NAME	PERCENT BY VOLUME
75-21-8	ETHYLENE OXIDE	> 99.7

This information must be included on all MSDSs that are copied and distributed for this material.

16. Other Information

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).